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EXAMINER

LEYSON, JOSEPH S

ART UNIT

PAPER NUMBER

1722

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/592,003

Applicant(s)

MCHUGH, KEVIN M.

Examiner

Joseph Leyson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 16-24 and 32-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 16-24 and 32-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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1. In the amendment filed on 21 April 2003, the amendments to the claims did NOT include instant claim 35. The examiner understands instant claim 35 to still be pending. If applicant intends instant claim 35 to still be pending, applicant should list instant claim 35 as original in the amendments to the claims in response to this office action. If applicant intends to cancel instant claim 35, applicant should list instant claim 35 as canceled in the amendments to the claims in response to this office action.

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-8, 16, 17 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lavernia(-604) taken together with Alvarez et al.(-853) and Garner et al.(-152) in view of O'Handley et al.(-004), Bowen et al.(-043) and Watson et al.(Nozzle-Aspirated Metal-Forming).

Lavernia(-604) discloses a system for the spray forming manufacture of an article including an atomization apparatus for

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forming an atomized spray of droplets including an atomizing nozzle 24, a heated liquid reservoir 20 in fluid communication with the nozzle 24 and means 28 for providing an atomizing gas; a chamber 18 adapted to contain a quench gas, such as argon, nitrogen and helium (col. 8, lines 24-36), having a controlled atmosphere (i.e., composition, pressure, etc.) for forming undercooled and partially solidified droplets (col. 5, lines 27-39, lines 62-65; col. 7, line 38, to col. 9, line 9); means (see fig. 1) for directing and depositing the undercooled and partially solidified droplets onto a pattern (col. 15, lines 1-6) to form an article; and means 56 for providing relative movement between the nozzle and the pattern. Note that a gas temperature is directly affected by the gas pressure, i.e., the ideal gas law formula, $PV=nRT$. However, Lavernia(-604) does not disclose the combination of a nozzle, a liquid reservoir and means for flowing a high temperature atomizing gas, as recited by the instant claims, or the article being a mold.

Alvarez et al.(-853) disclose converging/diverging nozzles 100, 100a for spraying or atomizing liquids, having flow channels with linear transverse cross-sectional geometries, the flow channels having inlet ends, outlet ends and longitudinal axes, a liquid material being injected through a conduit 3, 3a ending in the nozzle flow channel between the inlet and outlet

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ends and proximate to the nozzle longitudinal axis, the nozzles 100, 100a having temperature control elements 2, 2a, 4, 4a, the delivery pressure of the liquid being changeable (col. 4, lines 15-30), and means for flowing a high temperature atomizing gas, such as argon, nitrogen, helium, neon and air (col. 2, lines 56-62), at a flow velocity of supersonic velocities through the nozzle flow channel from the inlet end to the outlet end to atomize the liquid injected into the flow channel into a plume of atomized droplets (col. 3, lines 51-57). The nozzle flow channel converges to a choke portion located between the inlet end and the outlet end, and diverges between the choke portion and the outlet end (see figs. 1 and 2). The liquid material is injected into the nozzle flow channel proximate to the longitudinal axis between the choke portion and the outlet portion (see fig. 1) or between the inlet end and the choke portion of the flow channel (see fig. 2). The nozzle may have multiple separate liquid inlets into the flow channel, which inlets are fed by multiple separate liquid feeds (col. 3, lines 13-16; col. 6, lines 25-34). The nozzles apply to forming metal powders (col. 1, lines 40-43, i.e., gas atomization of metal) and form a spray of substantially uniform droplet size (i.e., col. 1, lines 13-17; col. 2, lines 15-24).

Garner et al.(-152) disclose a spray forming system for making a mold by spraying metal around a pattern (i.e., see abstract).

O'Handley et al.(-004) disclose a spray forming system including an atomization apparatus with a gas atomizer 13 and a crucible 14, a chamber having a quench gas such as helium or argon (col. 4, lines 56-65; col. 5, lines 26-48), and a pattern 26 for deposition. When the gas pressure is increased, the droplet size is decreased and the quench rates increase thereby enhancing formation of undercooled and partially solidified droplets (col. 7, lines 4-53).

Bowen et al.(-043) disclose a spray forming system including an atomization apparatus with an atomizing nozzle 14c, a pressurized heated liquid reservoir 14 in fluid communication with the nozzle 14c and a gas atomizer 18, the nozzle 14c forming droplets directed to a chamber B containing a quench gas such as argon (col. 8, lines 24-47), the quench gas having a controlled temperature and composition for controlling the in-flight cooling of the droplets (col. 1, lines 35-41; col. 7, line 54, to col. 8, line 5; col. 8, lines 24-56; col. 10, lines 17-34), means for directing and depositing the cooled atomized droplets onto a pattern 30 to form the article (col. 4, line 38, to col. 5, line 62). Bowen et al.(-043) disclose that when the

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gas chamber pressure is reduced, the droplet size is increased the convective heat loss to the droplets is reduced. Note that Bowen et al.(-043) also teach the converse. For example, Bowen et al.(-043) discloses (col. 10, lines 27-31) "by reducing droplet thermal convection heat loss that otherwise can occur at higher spray chamber pressures" (i.e., higher chamber pressures increase droplet thermal convection heat loss), and (col. 11, lines 7-11) discloses spraycasting "at 400 torr or less pursuant to the invention versus 730 torr as used heretofore also allows for scalability of the method and apparatus to make larger diameter preforms (deposits) as the convective cooling is lessened with an attendant increase in spray and deposit temperature" (i.e., scalability allows the convective cooling to be lessened or increased along the desired scale depending on how large or small to make the preforms).

Watson et al.(Nozzle-Aspirated Metal-Forming; pp. 1-16) disclose that converging/diverging nozzles (fig. 2(b)) can be used to atomize liquids in spray forming apparatus, alternatively to conventional atomization apparatus (fig. 1). Note that a liquid reservoir is in fluid communication with the converging/diverging nozzle in fig. 2(b).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the

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atomization apparatus of the system of Lavernia(-604) with a converging/diverging nozzle apparatus as disclosed by Alvarez et al.(-853) because Watson et al.(Nozzle-Aspirated Metal-Forming) disclose that converging/diverging nozzles can be used to atomize liquids in spray forming apparatus alternatively to conventional atomization apparatus, and to modify the system of Lavernia(-604) such that the article is a mold because a mold is an article that can be made by spray forming as disclosed by Garner et al.(-152). As to controlling the chamber atmosphere for increasing the in-flight convection cooling of the atomized droplets thereby enhancing formation of undercooled and partially solidified droplets, as recited by the instant claims, it is clear from the disclosures of Lavernia(-604), O'Handley et al.(-004) and Bowen et al.(-043), as mentioned above, that the environmental conditions, such as gas pressures, gas temperatures and gas composition, affect the in-flight convection cooling of the atomized droplets and thereby the undercooling and solidification of the droplets. And both O'Handley et al.(-004) and Bowen et al.(-043), as mentioned above, respectively disclose that the in-flight convection cooling can be increased or decreased by changing the environmental conditions.

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4. Claims 18-24, 32 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lavernia(-604) taken together with Alvarez et al.(-853) and Garner et al.(-152) in view of O'Handley et al.(-004), Bowen et al.(-043) and Watson et al.(Nozzle-Aspirated Metal-Forming) as applied to claims 1-8, 16, 17 and 34 above, and further in view of Ashok et al.(-752).

Ashok et al.(-752) disclose a spray forming system including a plurality of nozzles for spraying incompatible liquids (fig. 3; col. 5, lines 44-50) to form an article of incompatible liquids.

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to further modify the system to have multiple nozzles because a plurality of nozzles would enable the system to make an article made of incompatible liquids as recited by Ashok et al.(-752).

5. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lavernia(-604) taken together with Alvarez et al.(-853) and Garner et al.(-152) in view of O'Handley et al.(-004), Bowen et al.(-043) and Watson et al.(Nozzle-Aspirated Metal-Forming) as applied to claims 1-8, 16, 17 and 34 above, and further in view of Rotolico et al.(-225).

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Rotolico et al.(-225) disclose a spray forming system which sprays liquid particles with solid particles to form a composite article (i.e., see abstract).

It would have been obvious to one of ordinary skill in the art, at the time the invention was made, to further modify the system by feeding liquids with solid particles to the nozzle because such a modification is known in the spray forming art and would produce a composite article as disclosed by Rotolico et al.(-225).

6. Applicant's arguments with respect to the instant claims have been considered but are moot in view of the new ground(s) of rejection.

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Read et al.(-820) is cited as of interest.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Leyson whose telephone number is (703) 308-2647. The examiner can normally be reached on M-F(8:30-6:00) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda Walker can be reached on (703) 308-0457. The fax phone numbers for the organization where this application or proceeding is assigned

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are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jl

jl
May 5, 2003


ROBERT DAVIS
PRIMARY EXAMINER
GROUP ~~1200~~ 1722

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